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# RMBS RESIDUALS: A PRIMER

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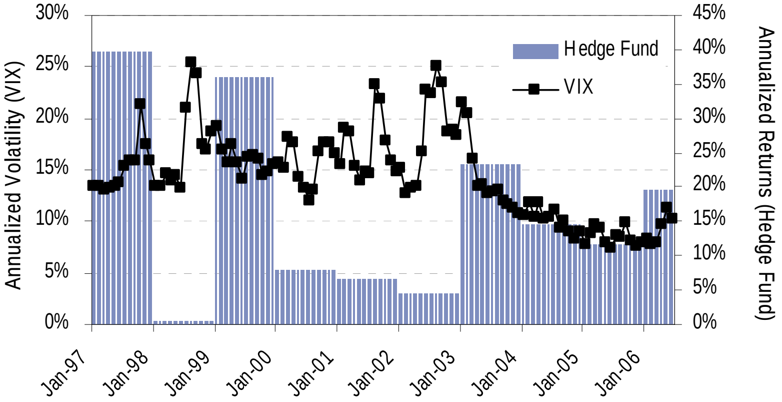
# INTRODUCTION

With cross-market volatility levels continuing to remain at multi-year lows, and credit spreads at historical tights, managers of alternative investment portfolios continue to seek out new sources of absolute return. This should not be entirely surprising, considering the fact that low volatility levels frequently provide the impetus for the persistent grinding in of spreads as investors chase nominal yields. For example, average hedge fund returns have been on a downward trend over the last few years as many of the classical volatility-driven strategies have struggled in an environment of solid fundamentals and stable markets. Figure 1 provides a depiction of historical returns for hedge funds with the VIX implied volatility index superposed. Indeed, improving fundamentals have shrunk the opportunity set for many investors, such as those operating in the distressed arena.

***Figure 1. Hedge Fund Returns vs. Volatility***



*Source: HFRSI, CBOE*

It is precisely this trend of declining returns and shrinking opportunities that has led to the heightened interest in leveraged credit as an alternative. As an example, many traditional alternative investors as well as hedge funds now invest in CDO (Collateralized Debt Obligations) equity, either in single-asset form (sometimes as a manager) or through specialized CDO equity funds. The appeal is a simple one: as volatility levels stay low and other, more traditional hedge fund strategies continue to struggle, a leveraged bet on credit is likely to perform well in the overall stable environment that low implied volatility levels are anticipating.

The purpose of this report is to introduce another asset class, RMBS residuals, into the menu of choices for alternative investors. RMBS residuals represent the equity interest in an RMBS securitization and offer return and duration profiles similar to CDO equity. While there are clear differences between CDO and RMBS equity, they have much in common too. As a result, the analytical and support infrastructure required for starting an investment program in residuals can leverage much of the existing support base for a CDO equity platform.

There is another reason why both RMBS residuals and CDO equity appeal to investors in alternatives. It is related to the relative value within the capital structure of a typical RMBS securitization. As valuations on subordinated RMBS debt tranches have tightened in response to demand from CDOs, the value "balloon" has gotten squeezed in the middle, in the rating stack that begins around single-A and ends at the triple-B minus level. Above the single-A level, it could be argued that there is enough subordination to support a stable asset profile, justifying an approach that relies on short-term financing to generate a high return on capital. At the bottom end, as the demand from ratings-driven investors ebbs, valuations cheapen up dramatically. For example, the difference in spreads between triple-B minus and double-B HEL securities is a whopping 300 bp.[1] Going down further in the capital structure, residuals offer prepayment and loss-adjusted yields of as much as 17% to 18%, with relatively short average lives and durations and front-loaded cashflows. In this respect, their investment characteristics are very similar to those of CDO equity, and complement the income stream from other more back-ended strategies in an alternative investment portfolio, thereby mitigating some of the harmful consequences of the typical "J-Curve" in these portfolios.

This report addresses several aspects relevant to a decision regarding RMBS residuals within an alternative investment allocation. First, we relate the steady growth in private-label originations to the increasing share of adjustable-rate mortgages in the outstanding universe. This is an important theme to highlight, since it implies that there is a greater likelihood of the sector developing into a broadly viable investment class. In other words, both the sponsors of these transactions and the investor community can take a systematic approach and develop the appropriate infrastructure required to originate and participate in the asset class. More importantly, these investments can be amortized across an investment portfolio that is likely to become sizeable and therefore justifiable in terms of the benefits it provides.

Next is a discussion of the underlying assets. After a brief overview of the structure of a typical RMBS transaction, we flesh out some of the nuances by using examples from two separate transactions that represent distinct

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[1] *Source: Bear Stearns*

segments of the market. In particular, the dependence of cashflows on underlying deal performance is highlighted, including such aspects as delinquency, loss and prepayment effects. Understanding these structural and collateral distinctions within the mortgage market is important, and while we discuss enough relevant material in this publication to provide a reasonable basis for further discussion, we do encourage our readers to spend time reading the companion volume—*The Bear Stearns Quick Guide to Non-Agency MBS*—which discusses many of these issues in greater detail.

Last, we provide a relative value overview of the contribution that structured credit is making to the menu of choices available for alternative investment managers. As is clear from the statistics provided here, the relative newness of the strategy implies a healthy yield pick-up over at least some alternatives that today have become more established asset classes in investors' minds. As a result, RMBS equity is likely to provide considerable opportunities for enhancing portfolio returns, at least as long as the incremental yield is not competed away entirely, due to the entry of capital into the sector.

## CDO AND RMBS EQUITY: MORE SIMILAR THAN DIFFERENT

In many ways, RMBS equity tranches (or residuals, as they are called in the RMBS world) have investment characteristics very similar to CDO equity as far as the nature and timing of their cashflows are concerned. In this respect, they provide the same advantages over private equity/hedge fund/venture capital strategies that CDO equity provides. In other respects, there are both similarities and differences. The sponsors of RMBS transactions provide the asset origination and selection functions which in turn determine the static pool of assets in an RMBS structure, just as CDO portfolio managers do. Most of this happens as part of a business flow where loans are originated on a continuous basis, warehoused for a temporary period, and then deposited into the transaction. Just as CDO managers are reliant on long-term, non-recourse financing of the assets they buy, RMBS sponsors also use the long-term, non-recourse debt available in the RMBS sector to sustain the financing needs of the business. Stable and diversified access to these debt markets is thus a critical linchpin of both businesses. As a result, there tends to be considerable focus on ensuring that transactions perform according to both market and rating agency expectations. The role of the CDO manager and RMBS sponsor are very similar in this respect, since both their business models are critically reliant on access to permanent and stable debt financing.

A key difference between the two stems from the static nature of RMBS transactions versus the actively managed CDO structure[2]. This does not mean, however, that the credit risk of the portfolio is not being actively managed. Rather, the role of servicer in the transaction becomes akin to the role of a CDO manager. In exchange for a fee that is senior in the waterfall, an RMBS servicer ensures adequate liquidity in the deal by advancing interest on delinquent loans, and exercises all possible effort to maximize the recovery proceeds on loans that go delinquent and cannot be cured.

It may be entirely appropriate in this respect to view investments in residuals as equivalent to investing in a “lightly managed” CDO with no reinvestment or substitution rights but where credit impairment-related sales are being actively managed by the servicer/manager of the transaction. Many of the criteria and decision-making processes that CDO equity investors have brought to bear on the determination of a “good” CDO manager can be applied in this context. This process is likely to be aided considerably by the intrinsic transparency of the public RMBS market,

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*[2] A few RMBS transactions, such as those backed by open-end lines of credit, do have reinvestment periods, but they constitute a relatively small share of overall issuance.*

where prodigious amounts of loan-level data related to servicer performance are available, in most instances, over several years or even decades. In addition, most rating agencies have developed systems for rating servicer quality and the surveillance of operational performance that could also be used by investors as an independent, third-party source of information. Finally, on-site due diligence, conducted in person, can help in completing the credit picture of the RMBS residual servicer.

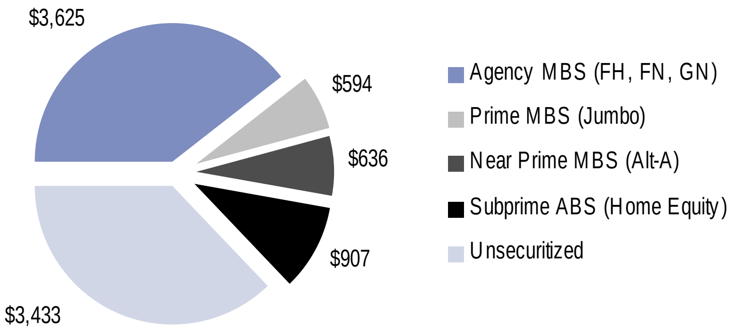
# THE U.S. RESIDUAL MARKET: POTENTIAL SIZE

According to the Federal Reserve, almost $9.2 trillion of residential mortgage debt was outstanding as of the end of 2005. Almost $3.63 trillion was held in agency residential mortgage-backed securities (RMBS), including those backed by guarantees from entities such as the Government National Mortgage Association (GNMA *a.k.a.* Ginnie Mae), the Federal Home Loan Mortgage Corporation (FHLMC *a.k.a.* Freddie Mac) and the Federal National Mortgage Association (FNMA, *a.k.a.* Fannie Mae).

Another $2.1 trillion of outstanding RMBS constitutes the private-label market, consisting of loans that make their way to the capital markets without the credit support offered by the sovereign or corporate ratings of Ginnie Mae, Fannie Mae and Freddie Mac. Akin to the traditional asset-backed (ABS) markets, these MBS are internally credit-enhanced and rely on ratings frameworks established by the rating agencies. While the distinction between these two markets has its roots in the loan size limits imposed on these sponsors, the private-label market has emerged today as a viable outlet for the securitization of loans of all sizes and credit quality.

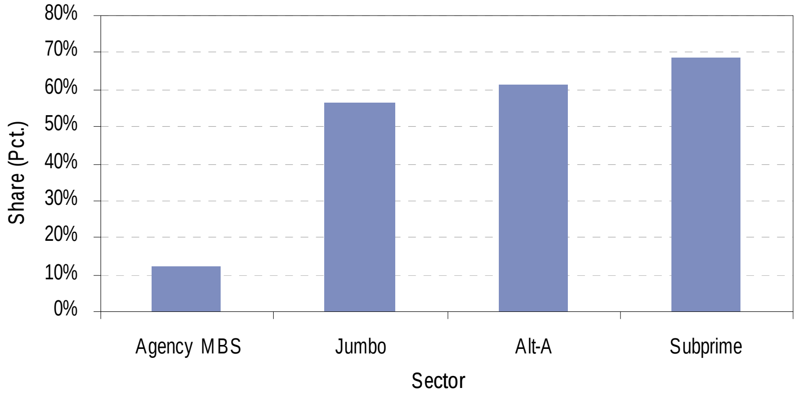
The composition of RMBS outstandings between the sponsored and the private-label markets is presented in Figure 2 while the share of adjustable-rate loans in the agency and non-agency sectors is presented in Figure 3. Finally, $3.4 trillion of outstanding residential MBS is held in unsecuritized form in the portfolio of various financial institutions.

***Figure 2. RMBS Outstandings as of January 2006***



*Source: Bear Stearns, LoanPerformance, Freddie Mac, Fannie Mae, Ginnie Mae, Inside Mortgage Finance*

*Figure 3. ARM Share, Agency and Non-Agency Outstandings*



It is our belief that the very different share of adjustable-rate mortgages in the outstanding agency and non-agency RMBS markets has important implications for industry structure in the two sectors. In a market dominated by fixed-rate mortgages, origination volumes tend to be highly cyclical and tied to interest rates. As a result, "monoline" mortgage originators, due to the cyclic nature of the business, cannot typically justify the fixed costs of maintaining an origination network. It is mostly commercial banks that of necessity maintain a retail network for taking in deposits which tend to be dominant players in the sector. Indeed, the motivation for many of the non-bank mortgage institutions (such as Countrywide and GMAC-RFC) to move into the non-conforming, private-label market was to diversify away from fixed-rate dominated segments of the market, which were characterized by very high-quality, but low-margin products and volatile issuance patterns.

In a market dominated by adjustable-rate loans such as the non-agency market today, the intrinsic "turnover" is allowing non-traditional players to vertically integrate. Under the circumstances, the fixed costs of running an origination platform can be sustained by at least a minimal flow of products, even in an unfavorable and rising rate environment.

In most instances, given the shape of the mortgage rate curve, borrowers have a substantial incentive to refinance into a similar product with a lower rate and a similar reset structure. Based on our estimates of the reset pattern of outstanding adjustable-rate non-agency RMBS, and assuming a conservative 50% annualized rate of paydowns after reset, this leads to an estimate of as much as $225 - $250 billion of securitizable issuance volume per year over the next five years from just resets. Adding household growth to the statistics naturally provides further impetus to these numbers. It is no surprise, therefore, that in recent weeks many banks with substantial investments in distribution and trading have announced acquisitions. Recent announcements include Saxon Capital (Morgan Stanley), Mortgage-IT (Deutsche Bank) and First Franklin (Merrill Lynch).

Given the potential issuance amounts just discussed, and assuming typical economic values for RMBS residuals (ranging from 3.8% for subprime to 7.5% for second-liens), we estimate the potential size of the RMBS residual market to be in the $7.5 billion to $10 billion range, without assuming any natural growth of the market. This compares quite favorably with issuance statistics in the cash CDO equity market where, based on recent trends, a similar range of $10 billion to $15 billion would be a good estimate. While at least a quarter to a third of the residuals may be held by originators, much like the practice in the CDO equity market, the potential scale of the numbers is likely to prove challenging for at least some players in the RMBS market and therefore provide the incentive to develop alternative sources of risk capacity.

# WHAT IS AN RMBS RESIDUAL?

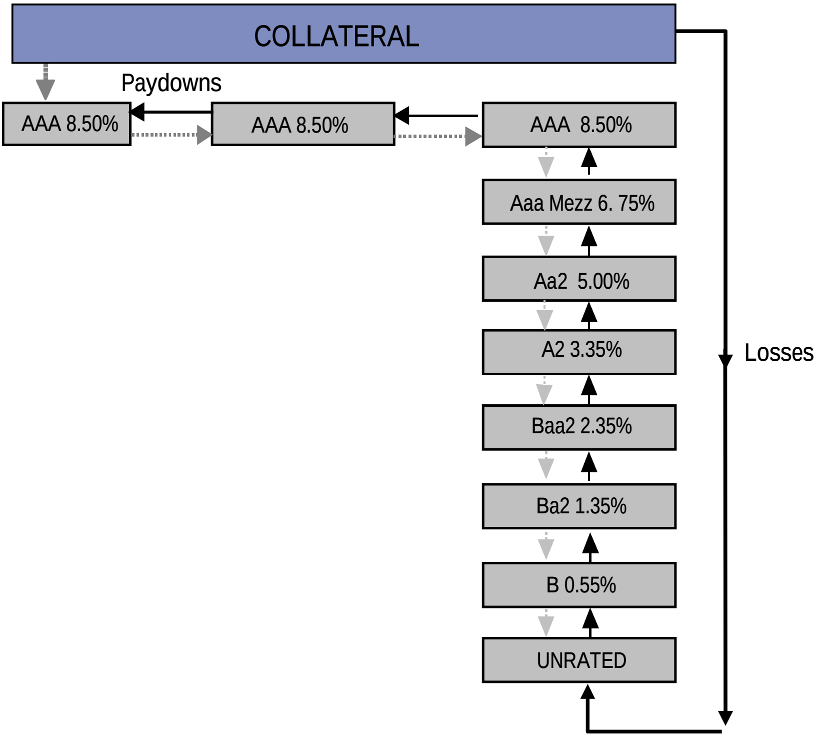
Simply put, an RMBS residual represents the difference between the net coupon on the loans (the gross coupon minus servicing fees and other ongoing deal expenses) and the weighted average cost of the debt in the structure, after covering for losses. In reality, this is an oversimplification and various features of the deals modify the definition as laid out here, but the essence remains true. Residuals are typically found in deals characterized as “OC/excess spread,” in contrast to others that are characterized as “shifting-interest or senior/sub.” The “OC” in this context refers to Over-Collateralization, defined as the difference between the par amounts of assets in the deal and the par amount of liabilities outstanding at any given moment. This section discusses the structural aspects of deals in which residuals exist, but also provides a context for these structures by contrasting them with the senior/sub model.

The variety of loan products in the U.S. RMBS market illustrates a key feature of the origination process: risk-based pricing of loans in the private-label markets. In other words, borrowers pay for the “put option” they are implicitly long in the form of a running premium added to the rate they would have otherwise paid had their loan been considered more creditworthy. In a broader sense, it is precisely this rate premium that becomes available to the holder of the residual class in an RMBS securitization.

Before we discuss residual structures in detail, it may be helpful to briefly describe the manner in which loans with little or *de minimis* credit risk are securitized. For example, mortgage loans backed by prime quality borrowers with very high credit scores (e.g. a FICO score around 750 and LTV ratios in the mid-60s) would typically be structured in a vehicle that would issue six classes of debt below triple-A (ranging from double-A to unrated), hence the moniker “six-pack.” The bottom unrated piece would constitute the equity in the deal. However, since the loans are very high quality, there is little or no excess interest available to cover credit losses. In this case, almost the entire spread on the loan above the risk-free rate is compensation for the prepayment risk on the loans. In most instances, the entire net coupon of the loans (i.e. the coupon available after paying the servicing fees on the loans) is passed through to bond investors. Of course, this aggregate spread on the underlying loans is not distributed uniformly across the tranches but is determined by each one’s specific rating.

Each debt class in the structure acquires its rating due to the fact that the class below is subordinated with respect to losses. In other words, any losses incurred on the pool are allocated first to the unrated equity class, and then up the rating chain, until the face amount of each tranche is exhausted. In this respect, a typical RMBS "six-pack" structure is very similar to the tranching on the iTraxx or CDX corporate indices that have predefined "attachment" and "detachment" points. Of course, the latter have no prepayment risk and reductions in the notional value of the corporate-backed tranches occur purely due to credit-related losses. Figure 4 describes the capital structure of a typical six-pack deal.

***Figure 4. Capital Structure, "Six-Pack" RMBS Transaction***



Typically, each class first receives its coupon from interest cashflows. All scheduled principal is then allocated pro rata to each class in the structure, but prepayments are allocated entirely to the triple-A class until a set period (5 years or 10 years, depending on whether the underlying loans are fixed- or adjustable-rate). After this period, prepayments to the non-senior classes are allocated in a "shifting" pattern, typically stepping up each year in 20% increments. As a result, by the 10th year (or 15th, depending on the type of deal), the non-senior classes in aggregate are receiving their pro rata share of all principal payments. Within the non-senior group however, the tranches are paid down in sequential order, from highest to the lowest rated class. The structure of the deal and the sizes of the rated tranches are determined by rating agency loss expectations for the specific set of loans in the deal. In order to protect the highest-rated classes from unforeseen circumstances that lead to losses coming in higher than originally expected, the allocation of principal repayments is subject to various performance triggers. For example, the deal may stipulate that if 60+ delinquencies exceed 12% of the current balance of the deal, all principal will be diverted to the senior classes.

How does a deal with a residual class differ from the structure we have just described? While there are a number of similarities, there are significant differences as well, and they can add up to very different relative value implications for the different parts of the capital structure.

In an OC/excess spread structure, deals are structured with an initial overcollateralization level, which could be 1.25% (e.g. for a subprime deal) of the face amount of the collateral pool[3]. The difference between the net interest received on the loans and the weighted average cost of debt is paid out to the residual holder after covering any current period losses. In addition, the residual holder may also be entitled to receive any prepayment penalty collections, although it is not always the case.

Each tranche in an OC/excess spread structure has a defined amount of subordination that must be maintained over the course of the transaction. If prepayments turn out to be such that the tranche has more subordination than required by the rating agencies, the tranches below it are paid in reverse order of seniority to get to the correct subordination level after the transaction goes past its “step-down” date. The step-down date typically refers to the date at which the lock-out of principal for the non-senior classes ends. From a cashflow perspective, the OC slice could be interpreted as a tranche that has its own required target level that must be maintained at all times. If the OC percentage rises above what is required, at the step-down date (typically 36 months), OC is released by diverting principal from rated debt to the residual holder to get the deal back in alignment with the indenture. In addition, if any of the tranches continue to be over-enhanced, principal cashflows are allocated in reverse order until each one is paid down to its “optimal subordination” amount. Thus, in a fast prepayment speed environment, mezzanine and subordinate tranches (including the OC which is really part of the residual class) can get substantial and “chunky” paydowns that can radically alter their investment characteristics.

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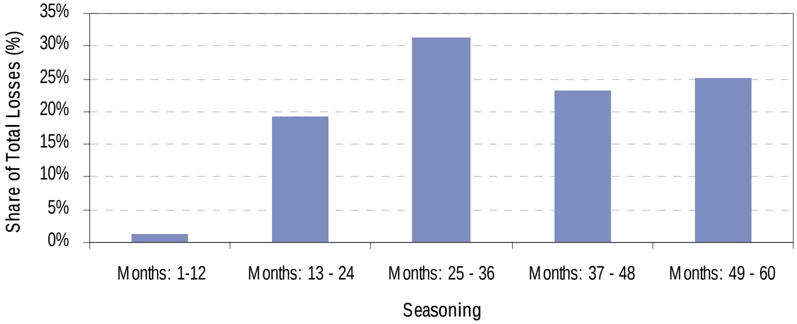
[3] *In the early days of the market, deals were typically structured with 0% OC at inception which would grow to its target level by diverting excess spread from the residual to “turbo” the senior classes. The development of the NIM and residual markets has moved the market to “fully-funded” OC structures so that the residual cash flows from inception.*

Since most transactions today start out with fully funded OC requirements, the residual tranche receives cashflow from the start. In addition, the lags between delinquency and ultimate recovery for loans that default, together with the requirement that servicers advance interest on delinquent loans until liquidation, imply that losses do not meaningfully impact the residual cashflows until at least 18 months to 2 years and do not reach their maximal level until about 3.5 years. By the third year, the basis of the residual is reduced substantially under many scenarios of early delinquencies and defaults. Of course, fast early prepayments will reduce the absolute amount of cash being generated, but they also tend to increase the size and potential for a large "OC" step-down, thereby improving the return characteristics of the investment.

In this respect, RMBS equity is substantially different from first-loss tranches in deals backed by corporate risk, such as leveraged loans or investment-grade corporate debt, as there is no "jump-to-default" risk in the transaction. The timing of losses is intrinsically back-ended due to the time lags in the RMBS foreclosure and recovery process. Scenarios that could prove detrimental to RMBS residuals, and to a large extent any first-loss tranche, are related to "whipsaw" risk, where prepayments accelerate initially and then slow down, while back-ended default rates rise substantially. We encourage potential investors to consider the impact of such scenarios on the returns of these investments.

The back-loaded nature of the default and loss curve is illustrated in Figure 5, where cumulative losses on 2001 vintage subprime ARM loans are expressed in terms of the share of overall losses (until now) over succeeding 12-month periods. Indeed, it is precisely the low frequency of losses in the early years of an RMBS deal that allows rating agencies to rate the front-end residual cashflows to levels as high as double-A. These rated securities are also known as Net Interest Margin (NIM) securities.

***Figure 5. Timing Curve of RMBS Losses***



# DEAL STRUCTURE AND RESIDUAL CASHFLOWS

In this section, we flesh out some of the concepts discussed in the last section using two specific deals to illustrate the salient issues. Our first case study comes from the subprime world and is a 2006 vintage transaction from the Bear Stearns Asset-Backed Securities (BSABS) shelf. The second case study examines another 2006 vintage transaction where the collateral pool consists of higher credit quality borrowers who have opted for pay-option ARM loans.

## CASE STUDY I: 2006 VINTAGE SUBPRIME RESIDUAL

### *Collateral Description*

This deal starts out with an original collateral balance of $331 million summed across 2,087 loans. The starting gross coupon on the loans is 8.6%, and the borrowers have an average FICO score of 619. First lien and combined LTV ratios are 83% and 89% respectively. Almost 47% of the loans are of the limited-documentation variety, an increasingly common aspect of loans in both the subprime and near-prime sectors. The share of loans in California is 21% while the share of investor properties is around 10%. Purchase money mortgages constitute about 46% of the deal while the IO share is around 20%. Further details on the collateral are provided in Table 1.

***Table 1. Collateral Profile (2006 Vintage Subprime)***

| | |
|---|---|
| Balance ($mm) | 330.9 |
| Number of Loans | 2,087 |
| GWAC | 8.6 |
| WALA | 2 months |
| ALS ($000's) | 158.7 |
| FICO | 619 |
| LTV | 82.8 |
| CLTV | 88.8 |
| % Single Family | 70.4 |
| % 2-4 Family | 8.7 |
| % PUD | 13.6 |
| % Condo | 6.6 |

| | |
|---|---|
| % CA | 21.5 |
| % Non-First Lien | 5.0 |
| % Full /Alt Doc | 52.7 |
| %Lim Doc/Stated | 47.3 |
| % No Doc | 0.0 |
| % Purchase | 46.1 |
| % Cashout | 48.3 |
| % Rate/Term Refi | 5.7 |
| % Owner | 88.3 |
| % Investor | 10.1 |
| % 2nd Home | 1.6 |
| % IO | 19.6 |

### *Capital Structure*

The full capital structure of the deal is described in the schematic laid out in Table 2, most of which should be self-explanatory. The description field captures the nature of the tranches both from a seniority as well as timing of cashflow perspective. For example, the term "Senior Sequential" implies that the cashflows that are allocated to the triple-A tranches in aggregate are paid out in sequential order to the 1-A-1, 1-A-2, and 1-A-3 tranches respectively. The terms "Mezz" and "Subordinate" simply refer to the priority of loss allocations within the structure if losses surpass a level that can be absorbed by the "residual," which is represented by the "CE" tranche and encompasses both the overcollateralization amount and the net excess spread entitlement. Finally, the "P" class represents the ownership of the stream of penalty income that can be generated due to the contractual provisions on the underlying loans. As borrowers prepay, the payoff amount is inclusive of these early redemption charges, which typically last for two to three years on subprime deals and are payable regardless of the reasons for an early redemption. In this respect, they are referred to as "hard" penalties as opposed to the weaker "soft" variety, which only have to be paid if the borrower refinances but does not sell the house.

***Table 2. Capital Structure (2006 Vintage Subprime)***

| Class | Class Size ($mm) | Ratings (S&P/Moody's) | Description |
|---|---|---|---|
| I-A-1 | 154.8 | AAA/Aaa | Senior Sequential |
| I-A-2 | 82.4 | AAA/Aaa | Senior Sequential |
| I-A-3 | 12.0 | AAA/Aaa | Senior Sequential |
| I-M-1 | 18.53 | AA+/Aa1 | Mezz |
| I-M-2 | 13.07 | AA/Aa2 | Mezz |
| I-M-3 | 7.61 | AA-/Aa3 | Subordinate |
| I-M-4 | 6.45 | A+/A1 | Subordinate |
| I-M-5 | 6.29 | A/A2 | Subordinate |
| I-M-6 | 4.96 | A-/A3 | Subordinate |
| I-M-7 | 4.3 | BBB+/Baa1 | Subordinate |
| I-M-8 | 2.5 | BBB/Baa2 | Subordinate |
| I-M-9 | 4.3 | BBB-/Baa3 | Subordinate |
| I-M-10 | 4.96 | BB+/Ba1 | Subordinate |
| I-M-11 | 3.81 | BB/Ba2 | Subordinate |
| CE | - | | Residual |
| P | - | | Prepay Penalties |

### *Payment Priority and Structure*

At origination, the overcollateralization target is 1.5% of the original collateral balance, representing the difference between the $330.95 million of collateral and the $326 million of rated debt. For the 1st to 36th month, all principal payments are attributed to the AAA tranches, which pay sequentially from I-A-1 to I-A-3, as described earlier.

On the step-down date (usually the 37th distribution date), principal can be allocated to the subordinate tranches in a manner that reverts the deal to its optimal subordination requirement for each class of securities. The required overcollateralization amount changes from 1.5% of the original collateral balance to 3% of the current collateral balance. However, the OC is floored at 0.5% of the original collateral pool. To the extent the post step-down, new OC requirement is lower in dollar terms, principal payments are allocated to the bottom of the capital structure to realign subordination. As a result, principal payments are applied first to the residual and most subordinate bonds if any excess subordination exists. Prior to a step-down occurring or in the event that the step-down does not occur, principal is attributed sequentially down the capital structure.

The step-down date occurs at the earlier of (1) the Class A balance (i.e. the sum of the I-A-1, I-A-2 and I-A-3 tranches) is paid off, or (2) the later of (i) month 37 or (ii) the credit enhancement percentage is greater than 49.4% The credit enhancement percentage is defined as the percentage of the balance that is either the subordinate debt or OC amount, i.e. CE percentage = (OC + subordinates)/current collateral balance.

The step-down occurs only if the deal is passing its triggers. If a trigger is in effect, the OC target is equal to the OC target from the immediately preceding distribution date. Triggers include:

1. Delinquency triggers: If the number of delinquencies exceeds 32.5% of the credit enhancement percentage, a trigger event is in effect. Delinquencies include loans delinquent for more than 60 days, loans in foreclosure, loans in REO, and loans that are discharged by reason of bankruptcy.

2. Loss triggers: If the cumulative losses on the balance exceed certain loss levels, a trigger event is in effect. The loss barriers are described in Table 3.

*Table 3. Cumulative Loss Triggers (2006 Vintage Subprime)*

| Distribution Date | Percentage |
|---|---|
| July 2009 through June 2010 | 3.45% |
| Plus an additional 1/12 difference between 5.4% and 3.45% for each month | |
| July 2010 through June 2011 | 5.40% |
| Plus an additional 1/12 difference between 7.0% and 5.4% for each month | |
| July 2011 through June 2012 | 7.00% |
| Plus an additional 1/12 difference between 7.25% and 7.00% for each month | |
| July 2012 and thereafter | 7.25% |

### *Residual Cashflows*

As explained earlier, residual cashflows represent the difference between the net coupon on the underlying loans and the weighted average cost of debt, which in this example is the sum of 1-month LIBOR (actual/360 basis) plus the weighted average spread on the liabilities, after trust expenses and periodic losses. If the residual class is entitled to receive the prepayment penalties, then any cashflows that go to the P class are passed through to the owner of the residual. Finally, if there are any derivatives embedded within the deal, such as a swap, the net swap payment may also be considered as part of the residual cashflows prior to the allocation of losses.

The use of such derivatives is necessary due to the basis mismatch stemming from collateral coupons that may be fixed for a certain period before they switch to floating coupons and debt that is indexed to LIBOR from the start. This leads to what is referred to as an “available funds cap” limit on the coupon payments on each tranche in the structure. It stipulates that the maximum permissible coupon on the floating-rate tranches is the lesser of the fully indexed coupon and the net coupon on the collateral. The use of caps or swaps is designed to raise this implicit ceiling that investors are short, in order to make the tranches more marketable; it simply becomes a cost to the deal. This is not unlike the hedging that takes place in some segments of the managed CDO market, where a significant component of the collateral may be fixed in nature.

The swap terms embedded within this particular transaction are described in Table 4. The underlying trust has entered into an amortizing swap to reduce available funds cap risk. The deal pays a fixed coupon of 5.407% on the following amortizing balance.

***Table 4. Amortizing Swap Notional Balance (2006 Vintage Subprime)***

| | | | | | |
|---|---|---|---|---|---|
| Jun-06 | 330,948,121 | Sep-07 | 199,321,678 | Dec-08 | 100,896,433 |
| Jul-06 | 327,219,657 | Oct-07 | 190,414,804 | Jan-09 | 96,454,758 |
| Aug-06 | 322,477,783 | Nov-07 | 181,912,032 | Feb-09 | 92,212,758 |
| Sep-06 | 316,725,489 | Dec-07 | 173,794,816 | Mar-09 | 88,159,873 |
| Oct-06 | 309,974,574 | Jan-08 | 166,045,477 | Apr-09 | 84,289,029 |
| Nov-06 | 302,247,146 | Feb-08 | 158,647,155 | May-09 | 80,591,440 |
| Dec-06 | 293,573,473 | Mar-08 | 151,583,767 | Jun-09 | 77,059,157 |
| Jan-07 | 283,995,270 | Apr-08 | 144,840,907 | Jul-09 | 73,684,694 |
| Feb-07 | 273,561,731 | May-08 | 138,422,882 | Aug-09 | 70,460,886 |
| Mar-07 | 262,341,248 | Jun-08 | 132,294,051 | Sep-09 | 67,380,937 |
| Apr-07 | 250,619,347 | Jul-08 | 126,441,170 | Oct-09 | 64,438,302 |
| May-07 | 239,393,183 | Aug-08 | 120,851,658 | Nov-09 | 61,626,771 |
| Jun-07 | 228,665,949 | Sep-08 | 115,513,515 | Dec-09 | 58,940,408 |
| Jul-07 | 218,426,380 | Oct-08 | 110,415,358 | Jan-10 | 56,373,560 |
| Aug-07 | 208,652,078 | Nov-08 | 105,546,631 | Feb-10 | 53,920,818 |

Since much of the underlying collateral is fixed in the early years of the deal, the swap minimizes the effect of an increase in short-term interest rates on the excess spread in the transaction and therefore on the residual class. While this protects the floating coupon of the debt holders, it also ultimately protects the excess spread available to the residual holder. It should be noted however that since the swap notional is not guaranteed to move in proportion to the paydown rate on the actual collateral, in certain situations it could serve as a drag on residual cashflows.

The excess spread calculations are summarized in Table 5.

***Table 5. Initial Excess Spread Calculation (2006 Vintage Subprime)***

| Date | WAC (%) | Servicing (%) | WA Spread (%) | Funding Rate (%) | Excess Spread (%) |
|---|---|---|---|---|---|
| 8/28/2006 | 8.589 | 0.5 | 0.245 | 5.33 | 2.51 |

### *Prepayment and Default Ramps*

The last remaining, and some would argue most important, pieces of the residual performance puzzle are embedded in the forecast of prepayments, defaults, and loss severities on the underlying loans. In our analysis presented here, the Bear Stearns Econometric Prepayment Model (EPM) and Econometric Default Model (EDM) generate these assumptions. These models are run simultaneously on the underlying loans, and calculate the conditional probability of prepayment and default in each period, conditional on having survived to the beginning of that period (a.k.a. hazard rates). Pricing is run to the relevant forward interest rate curves, with a 95% prepayment penalty collection rate on loans having a prepayment penalty and a flat 25% delinquency rate. These prepayment and default curves are described in Figures 6 and 7.

### *Prepayment Penalties*

As described earlier, the underlying collateral can consist of loans with and without prepayment penalties. Prepayment penalties are categorized both by their duration (e.g. one, two, or three years) and whether they are hard or soft. Hard penalties require payment under nearly all scenarios. Soft penalties can be waived under certain conditions, such as the sale of the home. The percentage and type of penalties in the deal can dramatically affect the prepayment profile and therefore the excess spread and subordination levels. The loans within the deal are all of the “hard” type and have the time profile show in Table 6.

***Table 6. Prepayment Penalty Profile (2006 Vintage Subprime)***

| | | % of Pool |
|---|---|---|
| Prepay Penalty | 1 yr | 3.4% |
| | 2 yr | 54.3% |
| | 3 yr | 13.6% |
| | Other | 20.0% |
| Total Penalty | | 71.5% |
| No Penalty | | 28.5% |

*Figure 6. Prepayment Ramps (2006 Vintage Subprime)*

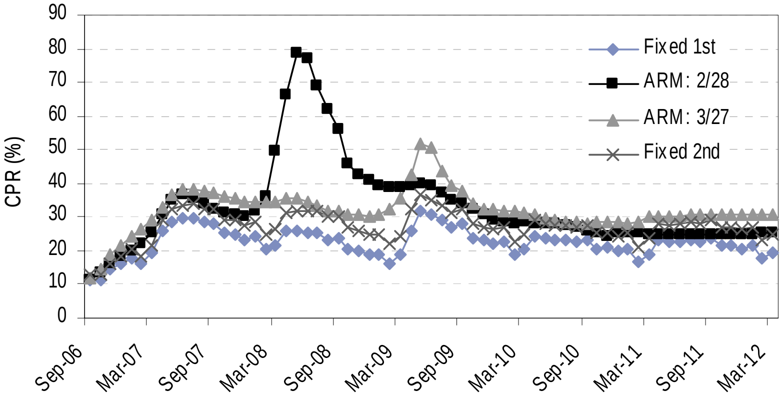
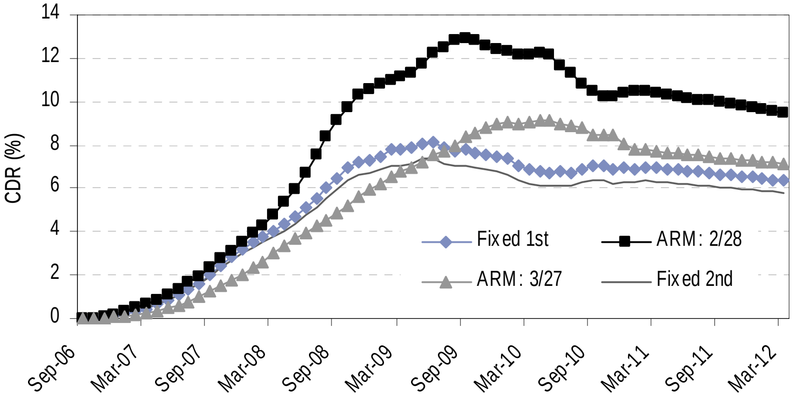


*Figure 7. Default Ramp (2006 Vintage Subprime)*



### *The Residual Yield Profile*

The combined effect of the structural features in the transaction, the collateral specification, and assumptions about prepayments, defaults, loss severities and delinquencies can be summarized in the yield profile of the residuals. This allows investors to assess the sensitivity of cashflows in terms of their timing and valuation to various permutations of the underlying parameters. In what follows, all valuations are done by assuming the deal lasts through its expected final date (i.e. to maturity) as opposed to being called at the optional 10% collateral clean-up call date.

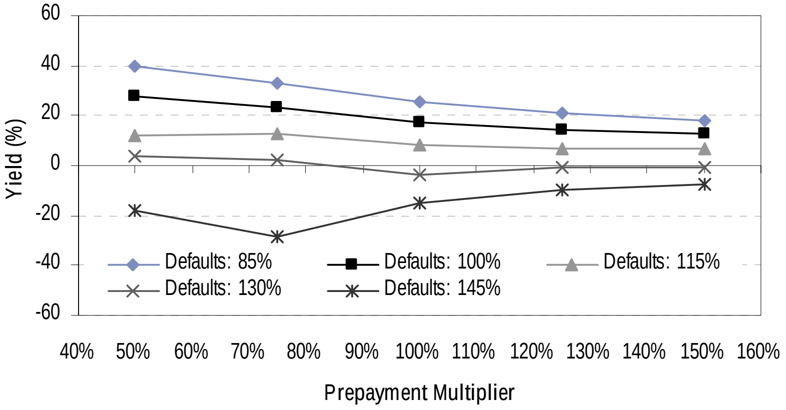
The profile of the residual on the example transaction is summarized in Table 7. Each cell in the table provides information about the yield at a given price (in this case, $3-20+), the average life of the collateral pool, the terminal cashflow date, the present value of the cashflows, the cumulative default on the collateral and the cumulative losses under the assumed severity parameter. Each cell represents the combination of prepayment and default scenarios expressed as a multiple of the baseline curves presented in Figures 6 and 7 earlier. In addition, as indicated earlier, all cashflows are generated to the relevant forward interest rate curves.

*Table 7.* ***Residual Yield Profile (2006 Vintage Subprime)***

| Curve Date: 9/8/2006 | | | Prepayment Multiplier | | | | |
|---|---|---|---|---|---|---|---|
| Settle Date: 9/22/2006 | | | 50% | 75% | 100% | 125% | 150% |
| Default Multiplier | 85% | Yield @ 3-20+ | 39.70 | 33.03 | 25.54 | 21.03 | 18.18 |
| | | CF Avg Life | 6.00 | 4.65 | 3.56 | 2.85 | 2.31 |
| | | CF End Date | 6/25/2036 | 6/25/2036 | 6/25/2036 | 6/25/2036* | 6/25/2036* |
| | | % Foreclosure | 19.65 | 12.96 | 8.65 | 6.12 | 4.58 |
| | | % Loss | 7.83 | 5.32 | 3.65 | 2.61 | 1.96 |
| | 100% | Yield @ 3-20+ | 27.62 | 23.15 | 17.14 | 14.58 | 12.78 |
| | | CF Avg Life | 6.56 | 4.59 | 3.42 | 2.48 | 1.98 |
| | | CF End Date | 6/25/2036 | 6/25/2036 | 6/25/2036* | 6/25/2036* | 6/25/2036* |
| | | % Foreclosure | 22.22 | 14.76 | 9.90 | 7.04 | 5.29 |
| | | % Loss | 8.83 | 6.05 | 4.16 | 2.99 | 2.25 |
| | 115% | Yield @ 3-20+ | 12.29 | 12.55 | 8.59 | 7.01 | 6.77 |
| | | CF Avg Life | 8.72 | 4.54 | 2.65 | 1.50 | 1.59 |
| | | CF End Date | 6/25/2036* | 6/25/2036* | 6/25/2036* | 6/25/2036* | 6/25/2036* |
| | | % Foreclosure | 24.58 | 16.45 | 11.09 | 7.92 | 5.97 |
| | | % Loss | 9.76 | 6.72 | 4.65 | 3.35 | 2.54 |
| | 130% | Yield @ 3-20+ | 3.82 | 2.45 | (3.84) | (1.11) | (0.79) |
| | | CF Avg Life | 6.79 | 4.23 | 0.95 | 0.99 | 0.99 |
| | | CF End Date | 6/25/2036* | 6/25/2036* | 2/25/2011 | 2/25/2011 | 2/25/2011 |
| | | % Foreclosure | 26.78 | 18.04 | 12.23 | 8.77 | 6.63 |
| | | % Loss | 10.62 | 7.35 | 5.10 | 3.70 | 2.80 |
| | 145% | Yield @ 3-20+ | (17.83) | (28.14) | (14.86) | (9.42) | (7.30) |
| | | CF Avg Life | 0.69 | 0.67 | 0.82 | 0.89 | 0.92 |
| | | CF End Date | 6/25/2036* | 6/25/2036* | 2/25/2011 | 2/25/2011 | 2/25/2011 |
| | | % Foreclosure | 28.81 | 19.53 | 13.30 | 9.58 | 7.27 |
| | | % Loss | 11.41 | 7.94 | 5.54 | 4.03 | 3.06 |

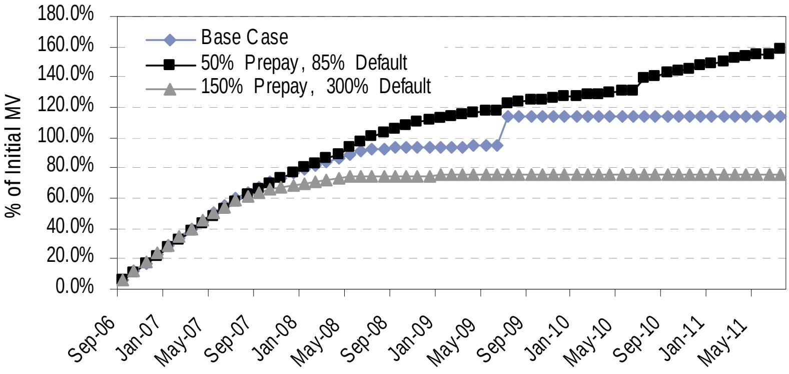
* *Other Scenario Assumptions: 1. 60% Collection Rates for Soft Penalties, 95% for Hards. 2. Forward MTA and Forward LIBOR*

*Figure 8. Prepay and Default Sensitivity (2006 Vintage Subprime)*



The cumulative cashflow projection, represented as a percentage of the initial market value of the residual, is presented in Figure 9. Under the baseline scenario (i.e. 100% of the prepayment and default curves), cumulative cashflows reach near the 100% mark by April 2009, which represents the 36th month and the step-down date of the transaction. Since no triggers are being breached under this scenario, and the actual overcollateralization amount is well in excess of the required OC level, the residual receives a lump-sum distribution of cash. This brings the cumulative cashflow total to a level near the maximum expected under the baseline scenario (approximately 118% of the initial market value that the investor would pay at the current time).

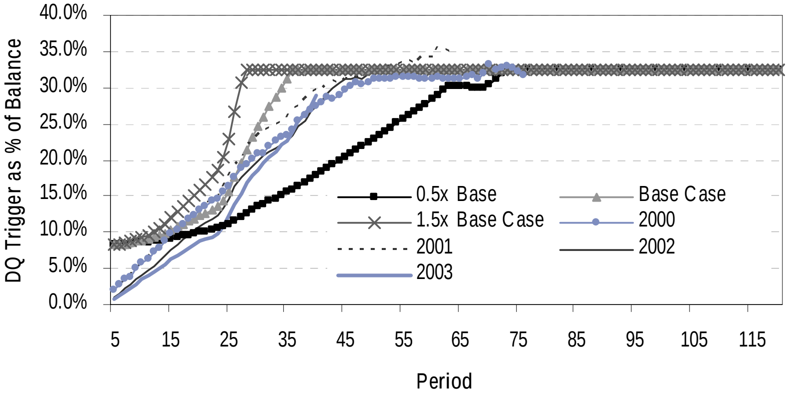
*Figure 9. Cumulative Cashflow as Percent of Initial Market Value (2006 Vintage Subprime)*



### *Delinquency and Loss Thresholds*

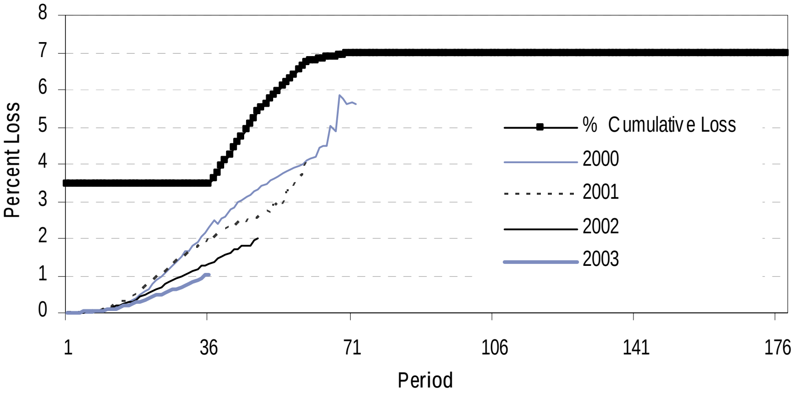
In this section, we provide charts that illustrate the pattern of delinquency (under three different prepayment scenarios) and loss thresholds. In Figure 10, the 60+ delinquency trigger is shown as a function of prepayment speeds. In addition, the figure also superimposes the historical delinquency rates for the 2000 to 2003 vintages, to provide a sense of the likelihood of hitting the trigger. Of course, future delinquency performance may turn out to be different than the historical experience, and hence this chart should be treated as providing a rough gauge.

***Figure 10. Effective Delinquency Threshold at Multiples of Base Case Prepayments (2006 Vintage Subprime)***



In Figure 11, we show the cumulative loss threshold compared to empirical vintage-level historical losses.

***Figure 11. Cumulative Loss Threshold (2006 Vintage Subprime)***



## CASE STUDY II: 2006 VINTAGE OPTION ARM RESIDUAL

### *Collateral Description:*

This deal starts out with an original collateral balance of $1,918.7 million summed across 6,321 loans. The starting gross coupon on the loans is 7.2%, and the borrowers have an average FICO score of 720. First lien and combined LTV ratios are 77% and 84% respectively. Almost 87% of the loans are of the limited-documentation variety, a common aspect of loans in the near-prime sector. The share of loans in California is 51%, while the share of investor properties is around 32%. Further details on the collateral are provided in Table 8.

***Table 8. Collateral Profile (2006 Vintage Option ARM)***

| | |
|---|---|
| Balance ($mm) | 1918.7 |
| Number of Loans | 6,321 |
| GWAC | 7.2 |
| WALA | 3 months |
| ALS ($000's) | 303.3 |
| FICO | 720 |
| Gross Margin | 330.0 |
| LTV | 77.2 |
| % LTV > 80 & No MI | - |
| CLTV | 83.8 |
| CLTV > 90 | 3.1 |
| Full/Alt Doc | 11.3 |
| % Lim Doc | 86.6 |
| % No Doc | 2.1 |

| | |
|---|---|
| % CA | 51.3 |
| % Single Family | 54.0 |
| % 2-4 Family | 11.3 |
| % Condo | 11.5 |
| % PUD | 23.3 |
| % Purchase | 38.2 |
| % Cashout | 44.0 |
| % Rate/Term Refi | 17.8 |
| % Owner | 64.0 |
| % Investor | 32.4 |
| % 2nd Home | 3.6 |
| % Penalty Hard | 65.5 |
| % Penalty Soft | 18.3 |
| % No Penalty | 16.3 |

### *Capital Structure:*

The full capital structure of the deal is described in the schematic laid out in Table 9. Again, this should be largely self-explanatory. The description field captures the nature of the tranches from both a seniority and timing perspective. The different groups in the description field refer to the segregation of collateral that affects the paydown of principal repayments to the senior classes. The term “Subordinate” again refers to the priority of loss allocations within the structure, if losses surpass a level that can be absorbed by the “residual” represented by the “BIO” tranche, which encompasses both the overcollateralization amount and the net excess spread entitlement. Finally, the "XP" class represents the ownership of the stream of penalty income that can be generated due to the contractual provisions on the underlying loans. As borrowers prepay, the payoff amount is inclusive of this early redemption charge, which typically last for two to three years. The final difference in the capital structure is the "Group IV Senior Interest Only (IO)" class that represents a fixed strip of 1%. Its cashflows are determined by the notional amount outstanding on the Group IV collateral pool.

***Table 9. Capital Structure (2006 Vintage Option ARM)***

| Class | Class Size ($mm) | Ratings (S&P/Moody's) | Description |
|---|---|---|---|
| I-A | 78.2 | AAA/Aaa | Group I Senior |
| II-A-1 | 492.2 | AAA/Aaa | Group II Super Senior |
| II-A-2 | 259.7 | AAA/Aaa | Group II Senior Support |
| III-A-1 | 145 | AAA/Aaa | Group III Super Senior |
| III-A-2 | 16.1 | AAA/Aaa | Group III Senior Support |
| III-A-3 | 200 | AAA/Aaa | Group III Senior |
| IV-A-1 | 305.3 | AAA/Aaa | Group IV Super Senior |
| IV-A-2 | 152.6 | AAA/Aaa | Group IV Senior Support Level I |
| IV-A-3 | 50.9 | AAA/Aaa | Group IV Senior Support Level II |
| IV-X | Notional | AAA/Aaa | Group IV Senior Interest Only |
| B-1 | 75.8 | AA+/Aa1 | Subordinate |
| B-2 | 42.2 | AA/Aa2 | Subordinate |
| B-3 | 11.5 | AA-/Aa2 | Subordinate |
| B-4 | 12.5 | A+/Aa2 | Subordinate |
| B-5 | 12.5 | A/Aa3 | Subordinate |
| B-6 | 25.9 | BBB/A2 | Subordinate |
| B-7 | 9.6 | BBB-/A3 | Subordinate |
| BIO |  | NR | Residual |
| XP |  | NR | Prepayment Penalties |

### *Payment Priority and Structure*

At origination, the overcollateralization target is 1.45% of the original balance. For the first 36 months, all principal payments are allocated to the triple-A classes, which pay sequentially within each group. The subordinate bonds are cross-collateralized[4] across all four groups.

On the step-down date, principal is allocated to the subordinate debt in a manner that reverts each class of debt within the deal to its optimal subordination level. The required overcollateralization amount changes from 1.45% of the original balance to 3.625% of the current balance. The OC is floored at 0.5% of the original balance. To the extent that the new OC requirement is lower, principal payments are allocated to the bottom of the capital structure to realign subordination. As a result, principal payments are applied first to the residual and then to each class of subordinate bonds (in reverse order) if any excess subordination still exists. Furthermore, in the 72nd month, the current OC target of 3.625% of the current balance is reduced to 2.90% of the current balance. Prior to a step-down occurring or in the event that the step-down does not occur, principal is attributed sequentially down the capital structure.

The step-down date occurs at the earliest of 1) the class A balance being paid off or 2) the later of (i) Month 37 or (ii) when the credit enhancement percentage is greater than 28.5% (22.8% after month 72).

As was the case earlier, the credit enhancement percentage is defined as the percentage of the balance that is either the subordinate debt or OC amount, i.e. CE percentage = (OC + subordinates)/current collateral balance. The step-down occurs only if the deal is passing its triggers. If a trigger is in effect, the OC target is equal to the OC target from the immediately preceding distribution date. Triggers include:

1. Delinquency triggers: If delinquencies exceed 24.5% of the credit enhancement percentage (30.7% after month 72), a trigger event is in effect. Delinquencies include loans delinquent for more than 60 days, loans in foreclosure, loans in REO, and loans that are discharged by reason of bankruptcy.

2. Loss triggers: If the cumulative losses, expressed as a percentage of the original collateral balance, exceed the levels in Table 10, a trigger event is in effect.

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[4] *The term cross-collateralization refers to the subsidization of losses from one collateral group using credit support from another.*

*Table 10. Cumulative Loss Triggers (2006 Vintage Option ARM)*

| Cumulative Loss % | Distribution Date |
|---|---|
| 0.30% | May 2008 through April 2009 |
| 0.75% | May 2009 through April 2010 |
| 1.35% | May 2010 through April 2011 |
| 1.90% | May 2011 through April 2012 |
| 2.65% | May 2012 through April 2013 |
| 2.90% | May 2013 and thereafter |

### *Residual Cash Flows*

Again, residual cashflows represent the excess of the net coupon generated on the underlying loans after all trust expenses and covering current period losses. In this case, the coupon on the underlying loans is indexed to the 12-Month MTA index while the debt is linked to 1-Month LIBOR. While the fixed-floating mismatch present in the previous case is removed, there is still a basis mismatch between the two underlying indices. The impact of this risk may not be as important to the rated debt classes, but the cashflows to the residual are clearly dependent on the size of the basis between the two indices. Due to the reduced impact on the rated classes, most deals in the sector are structured and marketed without an embedded basis hedge in the transaction. A basic outline of the economics behind the residual is provided in Table 11.

*Table 11. Initial Excess Spread Calculation (2006 Vintage Option ARM)*

| Date | WAC (%) | Servicing (%) | Insurance Premium (%) | WA Spread (%) | Funding Rate (%) | Excess Spread (%) |
|---|---|---|---|---|---|---|
| 8/28/2006 | 7.9 | 0.375 | 0.04 | 0.6 | 5.23 | 1.66 |

It should be noted that the gross excess spread presented in Table 11 is not static and will be affected by factors such as the MTA/LIBOR basis. In addition, the funding rate in Table 11 includes the cost of the fixed 1% coupon IO strip.

### *Prepayment and Default Ramps*

A baseline prepayment assumption is generated using the Bear Stearns prepayment model. The baseline curve appropriate for this transaction is illustrated in Figure 12. Due to the prime nature of the collateral, the underlying default rate assumption, illustrated in Figure 13, has a terminal value that is significantly lower than it is on subprime loans. In addition, the default rate forecast relies on the “Implied Default” methodology developed by Bear Stearns that normalizes the historical data on loan performance for home price appreciation that biases reported default statistics lower. The inclusion of zero loss severity defaults as a result of collateral appreciation both inflates the “implied default” measure relative to reported defaults, and reduces the “implied severity” on loans, relative to the reported severity metric, which treats these terminations as voluntary prepayments. These effects are especially important in the prime market, where the collateral tends to be more “mainstream” and where home prices on the underlying properties backing loans in the deal have a higher “beta” with the local housing market. As a result, these adjustments are critical to generating more accurate future cashflow projections on prime deals in an environment of slowing home prices. In this light, the use of historical reported loss severity as the relevant severity input in these cashflow runs could be viewed as generating conservative estimates of the actual residual cashflows that may be generated off this transaction, all else held equal. All projections are run at the loan level to account for differences in loan characteristics. Pricing is run to the forward curves with a 95% hard penalty collection rate and a 60% soft penalty collection rate.

### *Prepayment Penalties*

The underlying collateral can consist of loans with and without prepayment penalties. Prepayment penalties are categorized both by their duration (e.g. one, two, or three years) and whether they are hard or soft. Hard penalties require payment under nearly all scenarios. Soft penalties can be waived under certain conditions such as the sale of the home. The percentage and type of penalties in the deal can dramatically affect the prepayment profile and therefore the excess spread and subordination levels.

The Option ARM transaction has the following penalty profile:

*Table 12. Prepayment Penalty Profile (2006 Vintage Option ARM)*

| | | % of Pool |
|---|---|---|
| Hard Penalty | 12 Month | 32.1% |
| | 24 Month | 0.1% |
| | 30 Month | 0.1% |
| | 36 Month | 32.8% |
| | 42 Month | 0.3% |
| | 60 Month | 0.0% |
| Total Hard Penalty | | 65.5% |
| Soft Penalty | 12 Month | 0.3% |
| | 24 Month | 0.0% |
| | 30 Month | 0.0% |
| | 36 Month | 16.2% |
| | 42 Month | 1.7% |
| Total Soft Penalty | | 18.3% |
| Total Penalty | | 83.7% |
| No Penalty | | 16.3% |

*Figure 12. Prepayment Ramp (2006 Vintage Option ARM)*

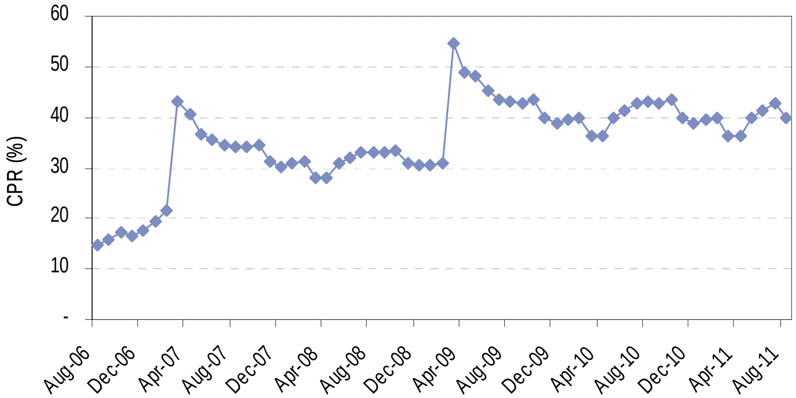
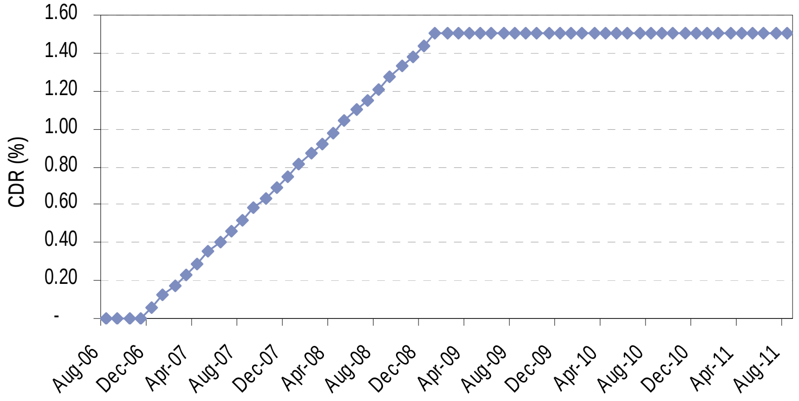


*Figure 13. Default Ramp (2006 Vintage Option ARM)*



### *Residual Yield Profile*

As before, the combined effect of the structural features in the transaction, the collateral specification, assumptions about prepayments, defaults, loss severities and delinquencies can be summarized in the yield profile of the residuals. This allows investors to assess the sensitivity of cashflows in terms of their timing and valuations to various permutations of the underlying parameters. In contrast to the prior case, however, all valuations assume the deal is called at the optional 10% collateral clean-up call date.

The diverging assumptions about the call are based on the differences in underlying borrower quality in the two deals. The clean-up call decision for the equity holder is largely determined by whether the market value of the collateral is sufficient to pay off the par amount of outstanding rated debt, plus accrued interest, once the collateral has paid down past the call threshold. In the case of subprime loans, the large delinquency buckets in the tail may make the decision to call less than optimal. In the case of near-prime quality borrowers, as is the case here, long-term delinquency rates are low enough to render the call decision optimal in most cases. Hence, the baseline scenario assumes that the call can be exercised profitably. This assumption can of course be changed, and the impact on valuations examined.

The profile of the residual on the example transaction is summarized in Table 13. Each cell represents the combination of prepayment and default scenarios expressed as a multiple of the baseline curves presented in Figures 12 and 13. In addition, as indicated earlier, all cashflows are generated to the relevant forward interest rate curves.

*Table 13. Residual Yield Profile (2006 Vintage Option ARM)*

| Curve Date: 9/8/2006 | | | Prepayment Multiplier | | | | |
|---|---|---|---|---|---|---|---|
| Settle Date: 9/22/2006 | | | 50% | 75% | 100% | 125% | 150% |
| Default Multiplier | 50% | Yield @ 4-15+ | 31.45 | 25.50 | 20.11 | 14.78 | 8.30 |
| | | CF Avg Life | 3.79 | 2.69 | 2.08 | 1.75 | 1.55 |
| | | CF End Date | 1/25/2017 | 7/25/2013 | 9/25/2011 | 8/25/2010 | 9/25/2009 |
| | | % Foreclosure | 2.99 | 1.81 | 1.20 | 0.83 | 0.56 |
| | | % Loss | 0.90 | 0.54 | 0.36 | 0.25 | 0.17 |
| | 75% | Yield @ 4-15+ | 29.40 | 23.70 | 18.55 | 13.45 | 7.27 |
| | | CF Avg Life | 3.72 | 2.67 | 2.07 | 1.75 | 1.55 |
| | | CF End Date | 11/25/2016 | 7/25/2013 | 9/25/2011 | 8/25/2010 | 9/25/2009 |
| | | % Foreclosure | 4.42 | 2.70 | 1.79 | 1.24 | 0.83 |
| | | % Loss | 1.33 | 0.81 | 0.54 | 0.37 | 0.25 |
| | 100% | Yield @ 4-15+ | 27.32 | 21.88 | 16.97 | 12.06 | 6.24 |
| | | CF Avg Life | 3.66 | 2.64 | 2.06 | 1.73 | 1.55 |
| | | CF End Date | 9/25/2016 | 6/25/2013 | 9/25/2011 | 7/25/2010 | 9/25/2009 |
| | | % Foreclosure | 5.82 | 3.56 | 2.37 | 1.65 | 1.11 |
| | | % Loss | 1.75 | 1.07 | 0.71 | 0.49 | 0.33 |
| | 150% | Yield @ 4-15+ | 23.05 | 18.09 | 13.72 | 9.37 | 4.18 |
| | | CF Avg Life | 3.56 | 2.60 | 2.03 | 1.72 | 1.55 |
| | | CF End Date | 6/25/2016 | 5/25/2013 | 8/25/2011 | 7/25/2010 | 9/25/2009 |
| | | % Foreclosure | 8.50 | 5.26 | 3.52 | 2.45 | 1.66 |
| | | % Loss | 2.55 | 1.58 | 1.06 | 0.74 | 0.50 |
| | 200% | Yield @ 4-15+ | 18.45 | 14.22 | 10.25 | 6.64 | 2.01 |
| | | CF Avg Life | 3.50 | 2.56 | 2.10 | 1.71 | 1.53 |
| | | CF End Date | 3/25/2016 | 3/25/2013 | 7/25/2011 | 7/25/2010 | 8/25/2009 |
| | | % Foreclosure | 11.04 | 6.89 | 4.64 | 3.24 | 2.20 |
| | | % Loss | 3.31 | 2.07 | 1.39 | 0.97 | 0.66 |
| | 300% | Yield @ 4-15+ | 8.68 | 6.24 | 3.93 | 1.60 | (1.85) |
| | | CF Avg Life | 3.93 | 2.77 | 2.29 | 1.90 | 1.59 |
| | | CF End Date | 9/25/2015 | 1/25/2013 | 6/25/2011 | 6/25/2010 | 8/25/2009 |
| | | % Foreclosure | 15.76 | 10.01 | 6.81 | 4.78 | 3.26 |
| | | % Loss | 4.73 | 3.00 | 2.04 | 1.44 | 0.98 |
| | 400% | Yield @ 4-15+ | 0.43 | (0.76) | (1.95) | (3.41) | (5.85) |
| | | CF Avg Life | 3.84 | 2.84 | 2.27 | 1.88 | 1.59 |
| | | CF End Date | 4/25/2015 | 10/25/2012 | 5/25/2011 | 5/25/2010 | 8/25/2009 |
| | | % Foreclosure | 20.03 | 12.93 | 8.88 | 6.28 | 4.30 |
| | | % Loss | 6.01 | 3.88 | 2.66 | 1.88 | 1.29 |

** Other Scenario Assumptions : 1. 60% Collection Rates for Soft Penalties, 95% for Hards. 2. Forward MTA and Forward LIBOR*

*Figure 14. Prepayment and Default Sensitivity (2006 Vintage Option ARM)*

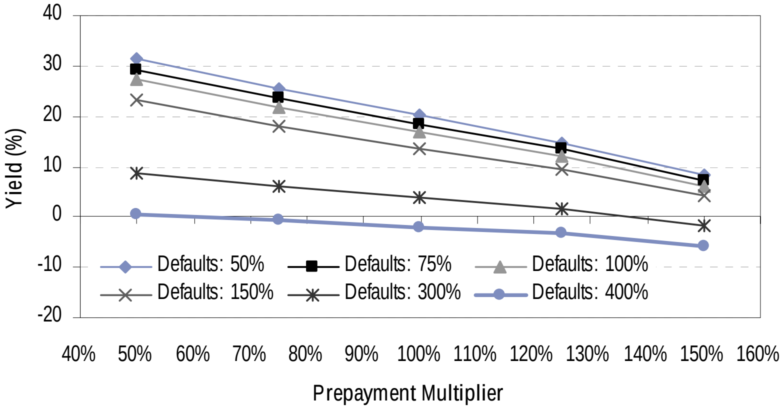
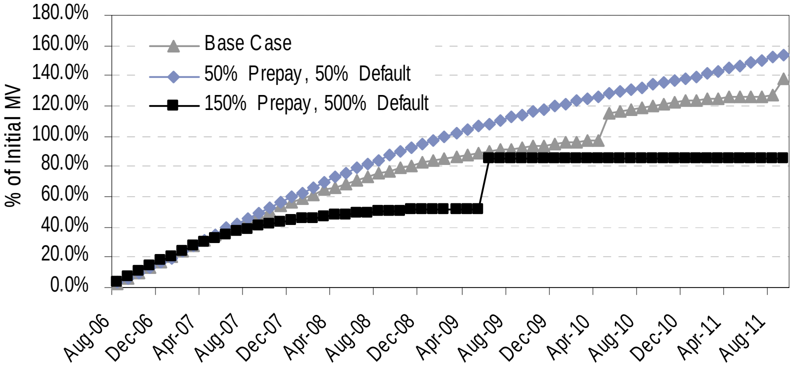


*Figure 15. Cashflow Projection as Percent of Initial Market Value (2006 Vintage Option ARM)*



The cumulative cashflow projection, represented as a percentage of the initial market value of the residual, is presented in Figure 15. Under the baseline scenario (i.e. 100% of the prepayment and default curves), cumulative cashflows reach near the 100% mark by February 2010, which represents the 36th month of the transaction, as well as the step-down date. Since no triggers are being breached under this scenario, and the overcollateralization amount is well in excess of the required OC level, the residual receives a lump-sum distribution of cash that brings the cumulative cashflow total to around 118%. The cumulative cashflow received then continues to increase to about 125% by August 2011. Around this date, the clean-up call threshold on the collateral is reached, at which time the deal is called, leading to a further jump in the cumulative cashflows to their terminal level of around 140% of the initial present value.

### *Delinquency and Loss Thresholds*

In this section, we provide charts that illustrate the pattern of delinquency (under three different prepayment scenarios) and loss thresholds. In Figure 16, the 60+ delinquency trigger is shown as a function of projected prepayment speeds. In addition, the figure also superimposes the historical delinquency rates for the 2003 to 2006 vintages so as to provide a sense of the likelihood of hitting the trigger. Of course, future delinquency performance may turn out to be different than the historical experience, and hence this chart should be treated as providing a rough gauge.

***Figure 16. Effective Delinquency Threshold at Multiples of Base Case Prepayments (2006 Vintage Option ARM)***

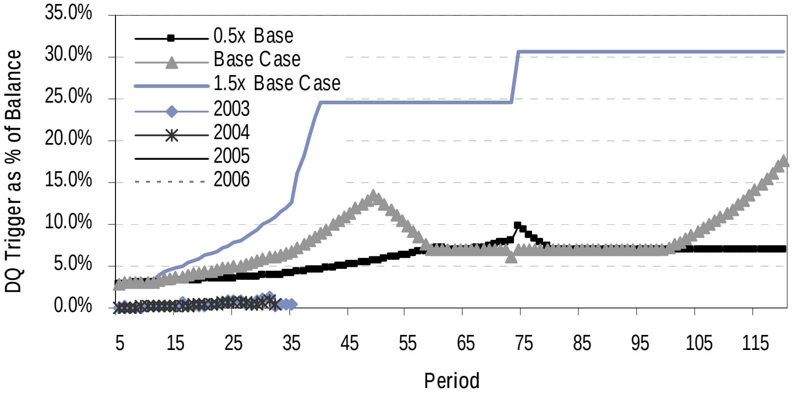
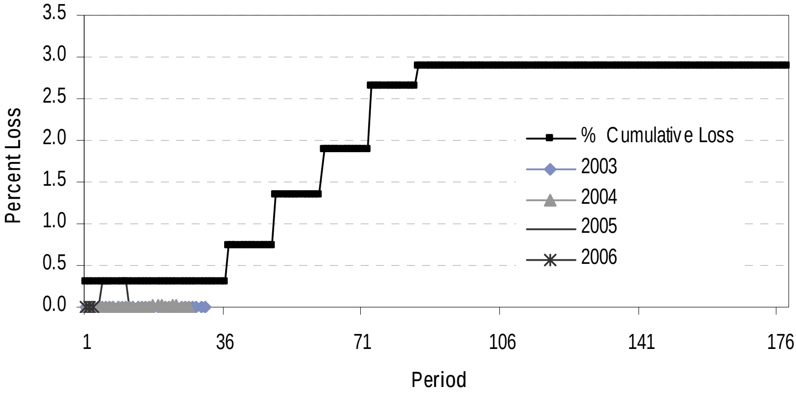


Figure 17 provides the schedule of cumulative losses (as a percentage of the initial pool balance) that determine the step-down condition.

***Figure 17. Cumulative Loss Thresholds (2006 Vintage Option ARM)***



# RELATIVE VALUE: PUTTING IT ALL TOGETHER

By now, you should have a good sense of the risk and rewards embedded in RMBS residuals and most importantly, the underlying assumptions that go into those calculations. In order to provide a context for the asset class within the scope of the structured credit markets, we provide in Table 14 a comparison of returns across various asset classes. We also summarize, in Table 15, many of the investment characteristics of CDO equity, RMBS residuals, private-equity and fixed-income hedge funds as a map to the alternatives sector.

***Table 14. Returns Comparison***

| Asset Type | CLO Equity | Mezz ABS CDO (Call)** | Mezz ABS CDO (Maturity) | HG ABS CDO (Call) | HG ABS CDO (Maturity) | 0%-3% 5Y IG | Mortgage Residual |
|---|---|---|---|---|---|---|---|
| IRR/Yield | 13.85% | 16.33% | 14.67% | 16.10% | 12.36% | 12.24% | 17.00% |
| Duration (in Years) | 4.00 | 4.39 | 5.30 | 5.50 | 9.50 | 3.50 | 1.5 |
| *Assumptions* | | | | | | | |
| Constant Default Rate | 3% | 0.50% | 0.50% | 0.00% | 0.00% | 0.00% | Depends on Collateral* |
| Recovery Rate | 75% | 60% | 60% | | | | 60% - 75% |

* *Typically a fully seasoned rate of 12% for subprime collateral and 1.5% for MTA collateral*
** *Run To Call in Year 7*

The relative returns presented in Table 14 suggest that mortgage residuals may be an alternative to many of the assets presented there. There is no “jump-to-default” risk in an RMBS pool, as our discussion earlier emphasized, which is not the case for both CLO and the 0 – 3% slice of the high-grade corporate index. The same holds true for ABS CDO equity which can cashflow for a period of time before the assets become impaired. One could argue that mortgage residuals offer traditional cash and synthetic CDO investors an opportunity to diversify their exposure to corporate-backed risk, in a format other than an ABS CDO investment.

Residuals offer only a marginal improvement over ABS CDO equity in the cases where the call on the latter can be exercised profitably. The yield pick-up improves if the CDO ends up not being called. In totality, the case for or against the two is less clear cut and a lot will depend on the specifics of each scenario, the interplay between prepayments and defaults and their timing, and the potential reinvestment risk in an ABS CDO. For example, slow prepayment speeds provide an immediate up-front benefit to the residual class, which could be offset by a greater probability of triggers failing and higher back-ended defaults. Subordinate RMBS debt will generally tend to benefit less in this scenario since it does not de-lever and also has exposure to back-ended defaults. Relative recovery rates on the two classes under this scenario will depend on a number of factors. The discussion here does suggest, however, the possibility of using capital structure trades that take advantage of the up-front nature of residual cash flows but also simultaneously hedge back-end credit exposure by buying protection on subordinate tranches, such as the triple-B minus class. In the interest of keeping this document as a "primer," we leave these types of analysis to a future publication.

*Table 15. Alternative Asset Comparison*

| | CDO Equity | Fixed Income Hedge Funds | Private Equity Funds | Mortgage Residuals |
|---|---|---|---|---|
| Investments | Public and private bonds and loans, secured and unsecured | Performing and distressed public corporate, sovereign and agency bonds, derivatives | Equity and convertible debt of private companies | Residential Mortgages |
| Investment Goals | Primary: Income | Varies, usually capital growth with income secondary | Capital growth | Primary: Excess Spread / Income |
| | Secondary: Capital Growth | | | Secondary: Capital Growth |
| Targeted Returns | 15% to 25% IRR | 20% to 30% IRR, lower current yield | 20% to 30% IRR, low current yield | 16% to18% IRR |
| | 17% to 30% current yield | | | |
| Cash Flow Return Profile | Front end and Intermediate end loaded | Generally at manager's discretion | Generally deferred, back end loaded | Front end and Intermediate end loaded |
| Duration of Cash Returns | 3 to 6 years | Varies | 5 to 15 years | 2 to 3 years |
| Asset Diversification | Medium to High | Highly variable by timing and style | Low to medium | Medium - Geographical / Loan Type |
| Primary Risks | Defaults and related loss | Interest rate & currency risk, margin calls, asset illiquidity, defaults | Execution of operating strategy, financing available, investment valuation and terminal liquidity | Primary: Prepayments, defaults and related loss<br>Secondary: Interest Rate Risk |
| Use of Leverage | Yes, term financing with no margin calls | Yes, short term with margin calls | Yes, equity investments in highly leveraged companies | Yes, term financing with no margin calls |
| Liquidity | Limited | Quarterly or annual may have longer lock-up | Limited | Limited |
| Transparency | High - portfolio disclosure monthly, typically have direct access to management | Generally limited | Medium - portfolio disclosed, discussions with management rare | Very High - loan performance monthly, typically based on loan level data |

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